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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/773,733	02/05/2004	Kyung-Ho Yoon	04-156	8603

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EXAMINER	
MONDT, JOHANNES P	
ART UNIT	PAPER NUMBER
3663	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/773,733	YOON ET AL.	
	Examiner	Art Unit	
	JOHANNES P. MONDT	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 February 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *10-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *10-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1 Form 1449*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. After-Final Amendment filed 02/02/09 has been entered. The finality of the Office action mailed 10/31/08 has been withdrawn and said Office action is herewith being replaced with the following Office action.

Information Disclosure Statement

2. Examiner has been mostly considered the Information Disclosure Statement filed 2/17/09. A signed Form PTO-1449 has been included with this office action as acknowledgment to the extent possible: two items has been lined through because their listings do not comply with MPEP 1.98(b)(5), requiring that "each publication listed in an information disclosure statement must be identified by publisher, author (if any), title, relevant pages of the publication, date, and place of publication".

Claim Objections

3. ***Claim 19*** is objected to under 37 CFR 1.75 as being a substantial duplicate of claim 16. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. ***Claims 10, 15, 17, 18 and 20*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Oyama et al (US 5,303,272), in view of Yoon et al (US 20030012329 A1).

Oyama et al teach a spacer grid capable of being used to place and support a plurality of longitudinal fuel rods in a nuclear reactor fuel assembly, comprising of:

a plurality of inner strips 7b (col. 3, l. 15 and col. 1, l. 23-30) intersecting each other to form a plurality of guide tube cells 3 (col. 1, l. 15-22) capable of receiving guide tubes (such a control rods) therein, and a plurality of fuel rod cells 5 (col. 5, l. 51-53) capable of receiving fuel rods 6 (col. 1, l. 33-37) therein, with a plurality of mixing blades (projecting upward from the top at intersections of inner strips 7b one of which is represented in Figure 11) projecting upward from the inner strips 7b at intersections of the inner strips (loc.cit.); and

a plurality of perimeter strips 7a (Figure 10, col. 3, l. 10-12 and col. 1, l. 23-30) each of which comprises a plurality of unit strips (Figures 8 and 10) including intermediate unit strips and corner unit strips by virtue of forming a matrix of grid cells with rank > 2 as shown in Figure 8, , the perimeter strips encircling the inner strips by virtue of forming a closed perimeter as shown by Figure 8, and the corner unit strips forming outermost corner cells of the spacer grids (loc.cit.), with a grid spring 10a (col. 1, l. 35) provided on each of the unit strips (Figure 10 and col. 1, l. 30-37), the grid spring comprising:

a vertical opening 11 (col. 1, l. 38-39) formed at a central area of each of the unit strips (Figure 10);

a vertical support part extending vertically in the vertical opening 11 from central portions of top and bottom edges of the vertical opening ('vertical support part' being met by the union of two elongated members each with single straight horizontal line bent and connected to each other through a central member: see Figure 10); and

a fuel rod support part provided at a central portion of the vertical support part (met by the aforementioned central member: see Figure 10),

further comprising

inner grid springs 10b on the inner strips 7b (see Figure 11 and col. 1, l. 30-37 and col. 3, l. 13-16), wherein the inner grid springs comprise an inner support part extending between edges of said inner grid springs (met by lateral flanks abutting 7b: see Figure 11), and an inner fuel rod support part provided on the inner support part (met by a central portion abutting laterally both flanks (see Figure 11), wherein the vertical support part and the inner support part are different in structure, geometry (the further limitation of claim 17 is thus also met) and shape (thus the further limitation of claim 18 is also met), because, unlike the vertical support part, the inner support part does not feature aforementioned straight line bents (juxtapose Figures 10 and 11): said straight line bents imply a different structure, geometry, because the structure with said bents is non-planar rather than planar, which is difference in structure, geometry and shape.

Oyama et al do not teach the limitations

a. "the fuel rod support part being bent to have equiangular surface contact with a fuel rod supported by the grid spring"; nor

b. "the inner fuel rod support part being bent to have equiangular surface contact with a fuel rod support by the grid spring"; nor

c. "the inner grid springs comprise an opening formed in the inner strips".

However, it would have been obvious to include limitations ad a and b in view of Yoon et al, who, in a patent application publication drawn to a spacer with grid springs for a nuclear fuel assembly (title, abstract), hence analogous art, teach conformal contact and enlarged elastic range (loc.cit.) through shaping an equiangular surface 45 of fuel rod support parts 50 both for inner and outer unit strips 15 of grid springs 20 (see [0062] and [0070-[0071]) so as to have enlarged contact area and uniform contact distribution and consequent reduction of peak (mechanical) stress (see [0070]-[0071]). *Motivation* to include the teaching by Yoon in the regard derives immediately from the accomplished reduction in peak stress exerted on the fuel rods as explicitly taught by Yoon et al ([0070[-0071]).

Furthermore, it would have been obvious to include limitation ad c as well in view of Yoon et al, because they teach the inner grid springs 20 to comprise an opening 30 in the inner strips 15 (see [0070] and Figure 7). One of ordinary skill in the art would have deemed it obvious to thereby further improve the capability of the inner support parts (36 and 38 in Yoon et al) to absorb the force transmitted from the fuel rod support part as specifically indicated by Yoon et al to be the objective of their design (see [0076]).

The claim would further have been obvious in this regard (ad c) because the technique for improving a particular class of devices such as those taught by Oyama et al, was part of the ordinary capabilities of a person of ordinary skill in the art, in view of the teaching of the technique for improvement in other situations such as those taught by Yoon et al. High level of predictability of success is insured because the formation of grid springs comprising openings in straps has long been recognized as a reliable form of manufacture, considering Yoon et al.

On claim 10: as already discussed supra, the vertical support part in Oyama et al is bent at two steps (above and below the fuel rod support part) along substantially horizontal bending lines (see discussion of claim 15 above), and after implementation of the teaching by Yoon et al the fuel rod support part is equiangular with the fuel rods (see [0062-[0071] and Figure 9(a), e.g.).

On claim 20: the fuel rod support part on Oyama et al is connected to the vertical support part at top and bottom edges (Figure 10) and the inner fuel rod support part is connected to two spaced inner support parts (Figure 11).

6. ***Claims 16 and 19*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Oyama et al and Yoon et al as applied to claim 15 above, and further in view of Mayet et al (US 6,542,567 B1) (previously cited) and Foulds et al (US 3,966,550) (previously cited).

As detailed above, claim 15 is unpatentable over Oyama et al in view of Yoon et al. Neither reference necessarily teaches the further limitation of higher or greater spring strength of the vertical support part than the inner support part as defined by claim 16,

or higher spring constant as recited in claim 19, where reference is made to the objection to claim 19 on account of being an essential duplicate of claim 16. However, it would have been obvious to include said further limitations in view of

(a) Mayet et al, who teach to use Zircaloy for the material embodiment of the straps including springs in those regions with the higher neutron flux (col. 1, l. 23-27) (examiner takes official notice that Zircaloy excels through low neutron cross section, whence the preference for Zircaloy under high neutron flux; see also DeMario (loc.cit.), col. 7, l. 10-16), while on the other hand it is known that the mechanical strength of Zircaloy diminishes rapidly due to neutron irradiation (see Mayet et al, loc.cit.) thus making it less preferable in the edge region where neutron flux is lower than in the center of the spacer grid; it would hence have been obvious to use a viable alternative for Zircaloy in the edge region, such as steel in view of

(b) Foulds (col. 9, l. 61- col. 10, l. 8) for which the recommended spring constant exceeds that for Zircaloy.

Motivation to include the teaching by Mayet et al and Foulds et al in the invention by Oyama et al as modified by Yoon et al derives from the advantage to reduce neutron loss by using Zircaloy while preventing mechanical deterioration of the springs where an alternative such as steel is acceptable because of reduced neutron flux.

7. ***Claims 11-12*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Oyama et al and Yoon et al as applied to claim 15 above, and further in view of Oh et al

(6,393,087 B1) (previously cited) and De Mario et al (5,303,276) (previously made of record).

On claim 11: As detailed above, claim 15 is unpatentable over Oyama et al in view of Yoon et al. Neither Oyama et al nor Yoon et al necessarily teach the entire limitation defined by claim 11. However, it is noted that Oyama et al do teach each of the *peripheral* unit strips to have a coolant flow guide vane (see protrusions at the top portions of outer straps 7a in Fig. 10). However, it would have been obvious to include both a coolant flow guide vane and a guide tap in view of Oh et al, who, in a patent on a spacer grid for a nuclear fuel assembly (see title and abstract), hence analogous art, teach that each of the intermediate unit strips has a coolant flow guide vane 30 (i.e., longer one of two structures 30 shown in the upper portion of Figure 9) and a guide tap (shorter one of two structures 30 shown in an upper portion of Figure 9) on an upper edge thereof (col. 7, l. 1-14 and Figure 9) such that a plurality of coolant flow guide vanes and a plurality of guide taps are alternately arranged (col. 7, l. 33-39) along an upper edge of each of the intermediate unit strips (loc.cit. and Figure 14 and col. 7, l. 15-24) for the purpose of enhancing mixing of the coolant fluid. The claim limitation would have been obvious because coolant mixing enhances coolant efficiency, as well known in all heat exchange art including the nuclear reactor cooling art. The claim would have been obvious because the technique for improving a particular class of devices such as taught by Oyama et al was part of the ordinary capabilities of a person of ordinary skill in the art, in view of the teaching of the technique for improvement in other situations as exemplified by Oh et al. See MPEP 2141.

Even Oh et al do not necessarily teach the further limitation that "each of the corner unit strips having either a coolant flow guide vane or guide tap on an upper edge thereof to complete an alternate arrangement of the coolant flow guide vanes and guide taps".

However, it would have been obvious to include said further limitation in view of De Mario et al, who teach upper and lower edges of the perimeter strips, and hence also of corner unit strips to have guide/protective/flow taps or vanes of different geometric dimensions bent inwardly in an alternating arrangement (Figure 3 in De Mario et al; see vanes over 320 and col. 8, l. 16-28), incorporation of the teaching in this regard by Mario et al thus completing an alternate arrangement of coolant flow guide vanes and guide taps in cooperation with the intermediate unit strips. *Motivation* to include the teaching by Mario et al in the invention by Oyama et al derives immediately from the noted advantage by De Mario et al that the inventive arrangement by De Mario et al succeeds in providing single-phase coolant flow distributed over each fuel rod even at high heat flux (col. 5, l. 19-24).

On claim 12: Furthermore, although neither Oyama et al nor Yoon et al nor Oh et al necessarily teach the further limitation as defined by claim 12, it would have been obvious to include said further limitation in view of De Mario et al, who teach each of the intermediate cells walls to have downwardly projecting guide taps (downward protrusions thereof as shown in Figure 3) at both corners (i.e., at both the left and right corner adjacent lattice members 310 of each intermediate unit strips and each of the plurality of corner unit strips has a guide tap projecting downward on a lower edge of each of the corner unit strips (see element 330 in Figure 3 of De Mario and col. 8, l. 28-

34). *Motivation* to include the teaching by Mario et al in the invention by Oh et al derives immediately from the noted advantage by De Mario et al that the inventive arrangement by De Mario et al succeeds in providing single-phase coolant flow distributed over each fuel rod even at high heat flux (col. 5, l. 19-24).

8. .***Claim 13*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Oyama et al, Yoon et al, Oh et al and De Mario et al as applied to claim 11 above, and further in view of Delafosse et al (4,224,107) (previously made of record).

As detailed above, claim 11 is unpatentable over Oyama et al in view of Yoon et al, Oh et al and De Mario et al. Furthermore, each of the coolant (flow guide) vanes in the reference most pertinent on guide vanes among the aforementioned reference, i.e., Oh et al, are bent toward a center of the spacer grid because each of said coolant vanes is shown, and in order to cause a swirl of the coolant fluid: must be, bent in two orthogonal directions so as to cause a swirl, i.e., a rotation of the fluid (see Figures 8 and 9 and col. 7, l. 1-68). Said two directions span a plane. The vector connecting each coolant flow guide vane with *a* center of said spacer grid toward a center of the spacer grid (as opposed to *the* center of said spacer grid (the latter may not even exist, in the case when the number of cells in either a row or a column is even), as any center of any element qualifies to be a center of said spacer grid). Furthermore, it is noted that Oh et al teach elements 30 to be "bent towards the center of the main flow path" (col. 7, l. 1-14), which center, when said flow path is taken as a whole, is substantially identical to the center in a horizontal cross section of the spacer grid. Oh et al also show a width of

each of said guide vanes reducing from a position at which each of said guide vanes is initially bent (see Figure 6), showing a tapered shape (loc.cit.).

Oh et al do not necessarily teach the further limitation that a peak of each of the guide vanes to be rounded. However, they do indicate that its specific shape is a matter of design choice because said shape can be chosen "in accordance with a desired swirl flow" (col. 7, l. 44-49). Furthermore, it would have been obvious to include said further limitation in view of Delafosse et al, who teach the rounding of protrusions 9 over unit strips 2 and 3 (hence structurally analogous to protrusions 30 of Oh et al), where the rounding is to as to avoid jamming (col. 3, l. 12-20). *Motivation* to include the teaching by Delafosse et al immediately derives from the advantage of the avoidance of jamming.

9. ***Claim 14*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Oyama et al, Yoon et al, Oh et al and DeMario et alas applied to claim 11 above, and further in view of Nguyen et al (6,526,116 B1) (previously made of record).

As detailed above, claim 11 is unpatentable over Oyama et al, in view of Yoon et al, Oh et al and DeMario et al. Although neither of the two references most pertinent to the features of guide vanes and guide taps, Oh et al nor DeMario et al, necessarily teach the further limitation defined by claim 14, it would have been obvious to include said further limitation in view of Nguyen et al, who, in a patent on nuclear fuel assemblies with spacer grid ("support grid", see abstract, first sentence) and mixing vanes (loc.cit.), hence analogous art, teach each guide tap 32 to be bent in two lateral directions orthogonal to each other, hence also in the direction towards the center of the spacer

grid (col. 5, l. 10-43, and Figures 1 and 2). *Motivation* to include the teaching by Nguyen et al in the invention derives from the resultant balance of hydraulic forces across the center of the grid (see abstract in Nguyen), which balance is beneficial to any spacer grid of a nuclear fuel assembly as in its absence the structure is unstable on account of force imbalance.

Response to Arguments

10. Applicant's arguments, see Remarks, filed 2/2/09, with respect to the rejection under 35 USC 103(a) of claim 17 have been fully considered and are persuasive. Upon further consideration and search the rejection of claim 17 has been withdrawn and the best art available at the current time has been applied to all the claims.

Conclusion

11. Applicant's amendment filed 8/11/08 necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHANNES P. MONDT whose telephone number is (571)272-1919. The examiner can normally be reached on 7:30 - 17:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack W. Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Johannes P Mondt/
Primary Examiner, Art Unit 3663